CHAIRMAN OF THE JOINT CHIEFS OF STAFF INSTRUCTION

J-3 CJCSI 3900.01A
DISTRIBUTION: A, B, C, J, S 10 August 1998

POSITION REFERENCE PROCEDURES

1. Purpose. This instruction establishes policy for the use of position reference systems for unilateral and joint operations of the US Armed Forces and for multinational operations with the military forces of allied nations.

2. Cancellation. CJCSI 3900.01, 21 March 1994, "Position Reference Procedures," is canceled.

3. Applicability. This instruction applies to the unified commands, Services, Defense agencies, and Joint Staff.

4. Policy

a. In unilateral operations, the US military force of the CINC involved will use the position reference system it deems necessary. However, World Geodetic System 1984 (WGS 1984) is recommended to ensure commonality.

b. In all joint operations, coordinates referenced to WGS 84 will be used. Universal use of the WGS 84 position reference system will eliminate confusion regarding which system is being used in reporting positions. If some preexisting circumstance precludes using WGS 84, the CINCs will coordinate on position reference procedures to be used. Because a wide variety of sources exist from which to derive coordinates referenced to WGS 84, the procedures for reporting positional information contained in the Enclosure to this instruction will be used.

5. Definitions. See the Glossary.

6. Responsibilities

a. Specifications and procedures for applying position reference systems to maps, charts, and related materials will be established by the Director, National Imagery and Mapping Agency (NIMA). WGS 84 is the official DOD positional reference system. NIMA will assist its allied coproducers in using this system. When WGS 84 cannot be used, NIMA will assist the CINCs in determining an appropriate reference system. NIMA will provide standard algorithms to perform datum transformation and coordinate conversion.

b. CINCs will develop procedures for coordinating the use of the WGS 84 system of coordinates in all joint operations involving US military forces. CINCs will coordinate with allied commands on position reference procedures to be followed within areas of multi-national interest. In cases where conditions preclude the use of WGS 84, CINCs will coordinate on position reference procedures to be used.

7. Reporting Process. See the Enclosure.

8. Summary of Changes. References to the Defense Mapping Agency were changed to the National Imagery and Mapping Agency.

9. Releasability. This instruction is approved for public release; distribution is unlimited. DOD components, other Federal agencies, and the public may obtain copies of this instruction through the Internet from the CJCS Directives home page -- http://wwwdtic.mil/doctrine/jel/cjcsd.htm. Copies are also available through the Government Printing Office on the Joint Electronic Library CD-ROM.

10. Effective Date. This instruction is effective upon receipt.

For the Chairman of the Joint Chiefs of Staff:

/Signature/
DENNIS C. BLAIR
Vice Admiral, U.S. Navy
Director, Joint Staff

Enclosure:
Reporting Process
Glossary

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ENCLOSURE

REPORTING PROCESS

1. When reporting positional information using a grid coordinate, the following items will be provided.

a. Type of Grid. The identification of the grid reference system of the source. Examples: MGRS, UTM, UPS, PDG, Atlas, etc.

b. Grid Coordinate. Linear or angular quantities that designate the position that a point occupies in a given frame or reference system. Examples: 32U NA123456, N123456E123456, etc. Note: a six-digit MGRS coordinate infers a precision of 100 meters and should not be used for missions requiring greater precision.

c. Feature Description. The narrative characterization of the geospatial feature by the coordinate represented. Examples: The top center of the Washington Monument; the base of the flagpole located on the north side of the Capitol Building, etc.

d. Horizontal Source System. The system identifier used to calculate or derive coordinates of the geospatial feature representation. Examples: JSIPS, DIWS, GPS, map, DPPDB, etc.

e. Position Datum. The horizontal or geographic datum identifier that denotes the numerical or geometrical quantity which uniquely serves as a reference for the production of the geospatial point position. Examples: WGS84, Tokyo, etc.

2. When reporting positional information using a Geographic Coordinate, the following items will be provided.

a. Latitude (x) Coordinate. The geographic coordinate identifying the position of a point with the ability to indicate precision to a thousandth of an arc second, north or south of the equator. Example: DDMMSS.SSS only (followed by “N” for north of equator or “S” for south of equator).

b. Longitude (y) Coordinate. The geographic coordinate identifying the position of a point with the ability to indicate precision to a thousandth of an arc second, 0 to 180 degrees east or west of the prime meridian.

Example: DDDMMSS.SSS only (followed by "E" for east of the zero meridian or "W" for west of the zero meridian).

c. Feature Description. See subparagraph 1c above.

d. Horizontal Source System. See subparagraph 1d above.

e. Positional Datum. See subparagraph 1e above.

GLOSSARY

DEFINITIONS

1. Geoid. The equipotential surface in the gravity field of the Earth that coincides with the undisturbed mean sea level extended continuously through the continents. The direction of gravity is perpendicular to the geoid at every point. The geoid is the reference surface for geodetic leveling (surveying) and some inertial navigation systems.

2. Ellipsoid. A mathematical figure generated by the revolution of an ellipse about one of its axes. The ellipsoid that approximates the geoid is an ellipse rotated about its minor axis. An ellipsoid serves as the mathematical model from which maps and charts are produced. However, numerous ellipsoids have been developed to support local datums. The use of the WGS 84 ellipsoid provides a single standard of reference within the Department of Defense.

3. Datum. A reference surface consisting of the following parameters: the latitude and longitude of an initial point (origin), the orientation of the network, and the two parameters of a reference ellipsoid. Coordinates for a particular ground location will vary based on the datum used to produce a particular map or chart. Therefore, it is essential that the datum used to derive the coordinates be included when reporting positions. WGS 84 now provides the single standard reference datum, or geographic reference system, within the Department of Defense.

4. Datum Transformation and Coordinate Conversion. NIMA has produced the Mapping Datum Transformation (MADTRAN) software to provide standard transformations between WGS 84 and the major local datums. The NIMA-developed software Datum Transformation and Coordinate Conversion (DT&CC) is an enhanced version of MADTRAN that allows users to convert coordinates from any two datums.

5. Map Projection. An orderly system of lines on a plane surface representing a corresponding system of parallels of latitude and meridians of longitude of the Earth or a section of the Earth.

6. Graticule. A network of lines representing parallels of latitude and meridians of longitude.

7. Grid. Two sets of parallel lines intersecting at right angles and forming squares. A grid is superimposed on maps, charts, and other similar representations of the Earth's surface in an accurate and consistent manner to permit identification of ground locations with respect to other locations and the computation of direction and distance to other points.

8. World Geodetic System 1984. The WGS 84 is an Earth-centered, Earth-fixed worldwide geodetic datum and reference system based on a determination of the Earth's parameters and gravity field. NIMA developed WGS 84 as the standard geographic reference system for use within the Department of Defense. NIMA uses WGS 84 in its production of maps and charts. NATO and the allied nations have approved, in principle, the use of WGS 84 for geospatial information purposes. WGS 84 provides uniform datum and reference system information for use in joint and multinational operations. In addition, the Global Positioning System (GPS), which is a navigation tool for air, land, sea, and space operations within the Department of Defense, is designed to work in WGS 84.

9. World Geographic Reference (GEOREF) System. The GEOREF system is a worldwide position reference system that may be applied to any map or chart graduated in latitude and longitude, regardless of projection. This method expresses latitude and longitude in a form suitable for rapid reporting and plotting.

10. Military Grid Reference System (MGRS). The MGRS is normally created by superimposing a metric, square grid on a Universal Transverse Mercator (UTM) or Universal Polar Stereographic (UPS) projection. The grid is printed on military maps and certain air and naval charts that include land areas. This position reference system provides a common system for the positioning of points on land or coastal areas and for the rapid computation of direction and distances between points.

11. Other Geographic, Square Military Grid Reference Systems. There are other geographic, square military grid reference systems similar to the MGRS. These systems are in some areas that have not been converted to the UTM grid.

12. Reference Systems (General). Any method of position referencing and reporting (coordinate system) is dependent upon the ellipsoid and datum used to model the Earth. Any distortions or inaccuracies in the sources of the coordinates, whether from topographic map, aeronautical or

hydrographic chart, digital data product, or other source can be compounded if different coordinates based on different datums are mixed when reporting positional information. For this reason, it is important to state the reference datum when using any of the grid or geographic systems defined above. To avoid confusion, the procedures established in the Enclosure of this instruction will be followed when passing or transmitting coordinates.

13. Reference Systems (Other). Some reference systems involve the use of a grid or use polar coordinates expressed in bearing (azimuth) and distance. The grid or polar coordinates may be permanently superimposed on maps or charts, or they may be temporarily established in relation to some fixed or moving point.